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| APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050 | | | | CROWELL, ANNA M |
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118

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 0504

Application Number: 09/774,192

Filing Date: January 29, 2001

Appellant(s): LI ET AL.

Kevin L. Pontius
For Appellant

EXAMINER'S ANSWER

MAILED
MAY 20 2004
GROUP 1700

Patent Counsel
Applied Materials, Inc.
Legal Affairs Department
P.O. Box 450A
Santa Clara, CA 95052

This is in response to the appeal brief filed February 27, 2004.

(1) *Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is substantially correct.

Claims 1-18, 20-28, and 33-42 are currently pending. No claims have been allowed.

Claims 19 and 29-32 have been canceled. Claims 3, 16-18, and 22-27 have been withdrawn from consideration as being directed to non-electing inventions. Claims 1-2, 4-15, 20-21, 28, 33-42 stand finally rejected. Claims 28, 33-39, and 42 are appealed. A listing of all pending claims 1-18, 20-28, and 33-42 and set forth in the attached Appendix, including appealed claims 28, 33-39, and 42 as finally rejected.

(4) *Status of Amendments After Final*

The appellant's statement of the status of amendments after final rejection contained in the brief is correct. An amendment after final was submitted on June 25, 2003 and has been entered. As a result of this amendment, the indefinite claim 14 was clarified. No new issues

were raised by this change, which was caused by this amendment. The Examiner maintained the final rejection in Advisory action filed on July 21, 2003, and indicated that the request for reconsideration was considered; however, does not place the application in condition for allowance due to the outstanding rejections.

(5) *Summary of Invention*

The summary of invention contained in the brief is correct. The present invention is directed to an apparatus for processing a semiconductor wafer. The apparatus includes a vacuum chamber, an RF coil, a heater, and a Faraday shield. The RF coil is disposed adjacent to the vacuum chamber. The heater is disposed outside of the chamber in thermal contact with the chamber wall and is disposed between the RF coil and the chamber wall. The Faraday shield is disposed between the heater and the chamber wall. By providing an apparatus with this configuration, simultaneous control of both the temperature of the dielectric lid and the electrostatic potential in the region directly adjacent to the lid is achieved and as a result produces conditions that are very favorable for achieving the desired plasma process results on the workpiece.

(6) *Issues*

The appellant's statement of the issues in the brief is substantially correct. The issue is if: Claims 28, 33-39, and 42 are unpatentable under 35 U.S.C. 103(a) over Guo et al. (U.S. 5,944,899) in view of Yoshida (U.S. 5,735,993).

(7) *Grouping of Claims*

The rejection of claims 28, 33-39, and 42 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and *reasons in support thereof*. See 37 CFR 1.192(c)(7). Claims 28, 33-39, and 42 stand or fall together.

(8) *ClaimsAppealed*

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) *Prior Art of Record*

| | | |
|------------|------------|---------|
| 5,944, 899 | GUO et al. | 08-1999 |
| 5,735,993 | Yoshida | 04-1998 |

(10) *Grounds of Rejection*

The following ground(s) of rejection are applicable to the appealed claims:

Claims 28, 33-39, and 42 are unpatentable under 35 U.S.C. 103(a) over Guo et al. (U.S. 5,944,899) in view of Yoshida (U.S. 5,735,993).

Claims 1, 2, 4-5, 28, 33-40, and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guo et al. (U.S. 5,944,899) in view of Yoshida (U.S. 5,735,993).

Referring to Figure 1 and column 2, line 51 – column 3, line 33, Guo discloses an

inductively coupled plasma reactor comprising a vacuum chamber 11 (semiconductor processing chamber), conductive wafer pedestal 22 (wafer support), gas distribution system 19 (gas delivery channel), and quartz dome 17 (dome-shaped lid, hemispherical-shaped lid), flange 18, sidewalls 14, base member 12 making up the chamber walls. A helical shaped RF induction coil 25 is disposed near the outside of the quartz dome. In addition, a fan 30, 31 is provided to exhaust the air in the annular space 26.

Guo fails to teach the heating element and a Faraday shield.

Referring to Figures 1, 2, and 7, column 3, line 51 – column 4, line 11, column 4, lines 29-57, and column 5, line 63- column 6, line 14, Yoshida teaches a plasma processing apparatus which uses a metallic resistor plate 3 (heating element, Faraday shield) to reduce capacitive coupling in the plasma and to heat the dielectric plate 2 (flat lid chamber wall). In Figure 7, both metallic resistor plate 1a (Faraday shield) and heater 1b (electrical, resistive heating element) are located in the dielectric plate 2 and have a circular shape with a plurality of radial slits 12. Metallic plate 1a (Faraday shield) acts in an electromagnetic-wave transmission function and heater 1b uniformly heats the dielectric plate 2. By using the metallic plate 1a, capacitive coupling is reduced and hence sputtering of the dielectric plate 2 is prevented. By controlling the heat of the dielectric, deposition of etching products on the dielectric plate 2 is suppressed. Furthermore, by reducing capacitive coupling and controlling the heat of the dielectric plate 2, the problem of contaminating particle generation is alleviated and etching condition stability is increased.

A temperature measuring element 6 (temperature sensor) measures the temperature of the dielectric plate 2 and a current controller 7 (power control circuit) controls the current supplied to the heater based on the feedback from the temperature measuring element 6. From Figure 7,

the heater 1b is positioned between the flat spiral coil 1 (RF coil) and the dielectric plate 2 (chamber wall), and metallic plate 1a (Faraday shield) is situated between the heater 1b and the dielectric plate 2.

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the chamber wall of Guo with the heating element and Faraday shield. This would reduce capacitive coupling in the plasma and prevent contaminants from forming on the dielectric plate, thereby alleviating the problem of contaminating particle generation and increasing etching condition stability.

(11) Response to Argument

Appellant has argued that the Yoshida reference rejects the placement of a Faraday shield and heater outside the chamber and instead advocates that the Faraday shield be placed inside the chamber ceiling along with the heater. Claim 28 requires that the heater and the Faraday shield are disposed outside of the chamber. In other words, the heater and the Faraday shield cannot be arranged in the interior space of the chamber. Thus, the claim is interpreted to read on the heater and the Faraday shield being located either on top of the chamber wall or within the chamber wall, and in either case, the heater is in thermal contact with the chamber wall. Therefore, the heater 1b and Faraday shield 1a of Yoshida is embedded within the chamber lid 2 (chamber wall), and the chamber lid 2 (chamber wall) is not located in the interior space of chamber 10. As a result, since the chamber lid (chamber wall) including the heater and the Faraday shield is not located in the interior space of the chamber, the 103 rejection of Guo et al. in view of

Yoshida satisfies the claimed requirement. Additionally, Claim 28 fails to preclude the heater and the Faraday shield from being located in the chamber lid.

Appellant has argued that the Faraday shield be located between the heater and the chamber wall. As seen in Figure 7 of Yoshida, the Faraday shield 1a is between the heater 1b and the top portion of the chamber lid 2 (chamber wall). Furthermore, even if Yoshida failed to explicitly teach the Faraday shield being located between the heater and the chamber wall, it would still be an obvious design modification since the mere arrangement of parts which does not modify the operation of a device is *prima facie* obvious. *In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975). Moreover, both the heater and the Faraday shield would operate the same regardless of the arrangement. Therefore, the 103 rejection of Guo et al. in view of Yoshida satisfies the claimed requirement.

Appellant has argued that the Yin reference (WO/52973) teaches away from placing a heater on the outside of the chamber. However, it should be noted that the Yin et al. reference is not included in appellant's sole issue on appeal which is whether claims 28, 33-39, and 42 are unpatentable under 35 U.S.C. 103(a) over Guo et al. (U.S. 5,944,899) in view of Yoshida (U.S. 5,735,993)), and thus the argument is irrelevant to the instant issue.

In summary, obviousness is determined based on the factual inquiries set forth in *Graham v. John Deere Co.*, 148 USPQ 459 (1966), namely determining the scope and content of the prior art, ascertaining the differences between the prior art and the claims at issue, resolving the level of ordinary skill in the pertinent art, and considering objective evidence present in the application indicating obviousness or unobviousness. In the instant appeal, the scope and content of the prior art is best represented by Guo et al., and the difference between Fuji et al and the claimed

invention is the use and location of the heater and a Faraday shield. As this difference is fairly suggested by Yoshida, both it and the claimed invention as a whole would have been *prima facie* obvious to one of ordinary skill in the art the time the invention was made.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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|------------------|----------------------|
| Michelle Crowell | Assistant Examiner |
| Gregory Mills | Supervisory Examiner |
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M. Mitchell Crowell
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May 17, 2004

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